CONCEPTUAL ESTIMATING WITH KSC COST INDEX

"CONCEPTUAL COST ESTIMATING USING KSC COST INDEX FOR CONSTRUCTION MANAGEMENT"

by

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CONCEPTUAL ESTIMATING WITH KSC COST INDEX

Conceptual Cost Estimating using KSC Cost Index for Construction Management

INTRODUCTION

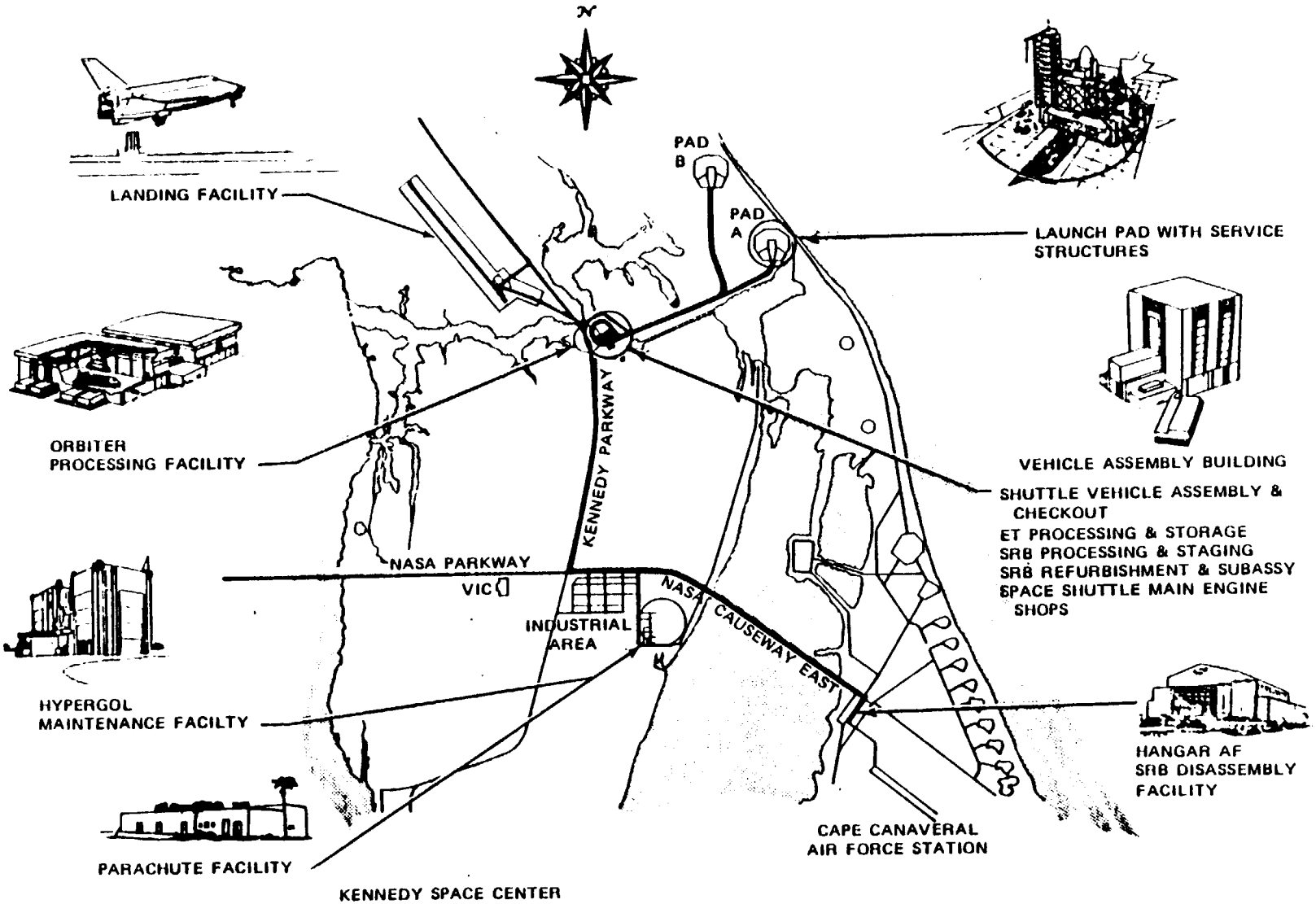
This presentation will discuss the development of the Kennedy Space Center Cost Index from January 1974 to the present time. One part of the cost index includes a graphic chart of the KSC labor and material indices which is used as an aid to evaluate past and present costs and for predicting the cost escalation on facility design and construction. Accurate cost predictions are imperative to ensure that real facility costs remain within funding allocation by congress on the basis of conceptual design and associated budget estimates.

This index incorporates price adjustments related to the KSC location and specialized construction requirements. It provides management, design engineers, and estimators an up-to-date reference for local labor and materials prices. It also provides the amount and rate of change in these costs which is used to predict future construction costs. The cost index is provided to the many engineering firms doing business with NASA/KSC so as to arrive at realistic and consistent cost estimates.

As part of the index, over 230 rule-of-thumb unit costs have been developed that aid in the conceptual formulation of budget cost for new and modified facilities. These rule-of-thumb costs have been developed using historical data based on past bid abstracts and the system summary of the Government estimate. Some of these rule-of-thumb unit cost items are for paving, earthwork, piling, reinforced concrete, structural steel, access platforms, special pneumatic sealed doors, bridge cranes, stainless steel piping systems, control panels, halon fire protection systems, mechanical and electrical and metal building systems and exterior utilities.

BACKGROUND

Kennedy Space Center is located on the northern portion of Merritt Island, Florida. Nearest labor markets are from 15 to 60 miles away in Orlando, Melbourne, Cocoa, and Daytona Beach. Major materials suppliers and warehouses are located in Tampa, Miami, Jacksonville and Orlando, at distances varying from 50 to 200 miles from KSC. The additional freight, travel-lost time, and extra warehousing costs result in higher job site costs. Compounding cost increases due to location are costs arising from specialized construction of exotic systems not normally encountered in conventional facilities. KSC facilities require a variety of highly specialized (and hazardous) systems to support launch activities and space vehicle research and development. Exotic systems mean exotic materials and a high number of special skills in the construction and supervision forces. All these factors translate into higher construction costs. Examples of specialized construction include: Uninterruptible Power Supply (UPS), Sterilization Encapsulation Facilities, High Pressure Piping, Hypergolic and Cryogenic Fuel and Oxidizer Systems, highly sophisticated Clean Rooms for the Assembly and Checkout of Manned and Unmanned Spacecraft for Earth Orbit or Distant Planetary Orbit or Landing, Solid Rocket Motors System, and an extremely complicated Electronic Telemetry Launch Processing System (LPS).



KSC Major Shuttle Facilities - Pictorial Baseline

WHAT ARE KSC FACILITIES AND HOW MUCH ARE THEY

Kennedy Space Center Shuttle facilities are shown in pictorial baseline, which gives an indication of their relative locations and configurations. These facilities were discussed in detail in "Bid Cost of KSC Shuttle Facilities." A summary of these costs are shown:

Shuttle Landing Facility	$ 25,922,137
Orbiter Processing Facility	$ 20,939,748
Vertical Assembly Bldg. Mods	$ 17,816,577
Launch Pads A & B, and Mobile Launchers #1 and #2	$ 76,653,187
KSC Industrial Area & Misc.	$ 17,742,001
Dryden Flight Research Center	$ 5,463,853
Total	$164,537,503

WHAT DOES THE COST INDEX DO?

The cost index incorporates price adjustments stemming from the KSC location and specialized construction requirements and informs project estimators and engineers what local labor and material prices are and the rate and amount of change. Price changes are related to a base index of January 1974 and compared to the latest index available. At present the index includes development of the more than 26 material cost items that correspond to the CSI/SPECSINTACT format, the labor base rate for the 21 basic crafts; and the breakdown percentage for each division. Price information in the index is given in terms of straight hourly rates for carpenters, masons, and supervisors and in terms of total square-foot costs of standardized KSC facility systems such as structural shell, block walls, plumbing, etc. The square foot cost index for standardized systems is proving to be extremely useful in forecasting costs of specialized systems.

WHEN IS THE COST DATA OBTAINED AND PUBLISHED

The labor and material prices are obtained on the tenth of the month. The index is then computed to give the monthly indexes. The charts are prepared, the other cost data is adjusted for the changes and submitted for approval by the fifteenth of the month. The index is published on the twenty-second day of the month or as directed. The cost index is calculated monthly but is published quarterly except when major price changes occur, justifying an extra or special monthly publication and distribution.

The Cost Index consists of 12 pages. The cover with Approval signatures; page 1 is the index, and description and use of cost data and cost engineering comments on changes; page 2 shows a graphic chart of the semiannually and monthly indexes from January 1974 to the latest month. Page 3 shows the current Davis-Bacon labor rates, and fringe for 21 basic crafts. Page 4 shows the development of crew rates for 19 divisions and the development of the labor cost index with January 1974 as 1000 for 100 hours of work. Page 5 shows the development of the material costs for the corresponding 19 divisions as the labor cost. There are 26 basic materials used with an adjusted base of 1000 in January 1974. These materials unit cost are the most commonly used materials in detail cost estimates, such as concrete and steel. Pages 6, 7 and 8 show the 230 budget rule-of-thumb cost for the major cost items used at KSC. These costs are based on actual bids and the government estimate. They include labor, materials, taxes and insurance, overhead and profit, and would be considered as bid prices. A Technical Report, TR-1508 - Budget Cost Data for Facilities Construction Elements - contains the many pages of back-up data for these unit prices (see sample). These unit prices are used for budget cost estimates, Preliminary Engineer-

ing Reports, and studies and in cross checking detail final government estimates. Page 8 also has a summary of the average annual increases for labor and materials and a forecast for the latest year. Page 9 shows estimated square foot costs for launch facilities, such as the Rotary Service Structure and the Orbiter Processing Facility. Page 10 shows estimated square foot cost for office, laboratory, operations facilities and average contract unit bid prices for six selected materials from the Florida Department of Transportation's latest quarters.

SUMMARY

This Cost Index is providing estimators, cost engineers, project and design engineers and management with more accurate uniform and consistent cost information, in a timely manner to aid in construction management of KSC Shuttle facilities and ground support equipment. The budget rule-of-thumb unit bid cost and prices are aiding in conceptual design cost estimates by making them faster and more accurate.

This cost data is also being provided to the Air Force, support contractor, as an aid in developing the budget cost estimate for the Shuttle facilities at Vandenberg Air Force Base in California.

This index is one of the many tools used by KSC Design Engineering to provide faster and more accurate cost estimates for the development of a more cost effective design and construction of KSC space vehicle facilities. These Shuttle facilities are being completed on schedule and under budget. These facilities will be used to launch and recover elements of the Space Transportation System which will assure the United States of continued pre-eminence in space exploration and development. The Shuttle will reduce the cost and increase the effectiveness of using space for commercial, scientific and defense needs.

REFERENCES:

1. Brown, Joseph A., "Construction Cost Control - After Bidding" presented at the Florida Section AACE Symposium in Miami Beach, January 21-24, 1978.

2. Brown, Joseph A., "KSC Cost Index for Construction Management" presented at the 19th Annual AACE Meeting, Orlando, Florida, June 29-July 2, 1975.

3. Brown, Joseph A., "Construction Bidding Cost of KSC's Space Shuttle Facilities" presented at the 23rd Annual AACE Meeting, Cincinnati, Ohio, July 15-18, 1979.

4. KSC Technical Report, TR-1508, Budget Cost Data for Facilities Construction Elements Revised October 22, 1979.

5. KSC Technical Report, TR-1511, KSC Monthly Facility Construction Cost Index, October, November, and December 1979.

THE KSC MONTHLY CONSTRUCTION COST INDEX

COST ENGINEER COMMENT

MATERIAL PRICES CHANGED WITH INCREASES FOR ASPHALT PAVING, READI MIX CONCRETE, 3/4" PLYFORM, LUMBER, WINDOWS, ACOUSTICAL TILE, VENETIAN BLINDS, ELEVATED FLOORS, STAINLESS STEEL PIPE AND COPPER TUBING. PRICES DECREASED FOR PLYWOOD, REBAR, CONCRETE BLOCKS, TOWER STEEL, ROLL ROOFING, FAB AND ERECT I-BEAM, CAST IRON PIPE AND ALUMINUM SHEET. LABOR RATES CHANGED WITH INCREASES FOR COMMON LABOR, SKILLED LABOR, IRON WORKERS AND PIPE FITTERS.

THE INDEX IS A MONTHLY COMPILATION OF GOVERNMENT AND KSC-LOCAL COST DATA PERTINENT TO ESTIMATING COSTS OF IMMEDIATE JOBS OR PROJECTING COSTS OF FUTURE CONSTRUCTION OF FACILITIES (C OF F) PROJECTS.

1. FOR DETAIL CONSTRUCTION COST ESTIMATING PAGES 1-5:

   A. REFLECTS THE CURRENT MANHOUR LABOR AND CREW RATES FOR 9 MAJOR CONSTRUCTION AREAS SUCH AS CONCRETE, STEEL, MASONRY, CARPENTRY, HEAVY CONSTRUCTION, CIVIL, ELECTRICAL & MECHANICAL.

   B. SHOWS CURRENT BASE PRICES FOR 24 MATERIALS, INCLUDING STEEL, CONCRETE, COPPER, STAINLESS STEEL, WOOD, AND MASONRY.

   C. PROVIDES A GRAPH SHOWING AMOUNTS AND RATES OF CHANGES IN LABOR AND MATERIAL COSTS, USING A BASE INDEX OF 1974 PRICES. THE GRAPH AIDS IN PREDICTING LABOR AND MATERIAL ESCALATIONS IN SPECIAL CONDITIONS PORTIONS OF COST ESTIMATES FOR 6 MONTHS TO 2 YEARS

2. FOR PER & BUDGET COST ESTIMATING PAGES 1-9:

   A. PROVIDES SYSTEMS ORIENTED BUDGET COST DATA FOR FACILITIES CONSTRUCTION ELEMENTS, MARKED-UP LABOR AND MATERIAL PRICES BASED ON ACTUAL BID PRICES.

   B. PROVIDES DATA FOR C OF F BUDGET ESTIMATING, PER ESTIMATING, AND CROSSCHECKING OF FINAL GOVERNMENT ESTIMATES.

   C. ESTABLISHES UNIFORMITY IN COST ESTIMATES PREPARED BY A&E DESIGN AGENCIES AND SUPPORT CONTRACTOR ORGANIZATIONS.

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SKILL	RATE	1/5	1/16	AVG. HR RATE	28% PT&I	FRINGE	BASE RATE & FRINGE ONLY	W/OUT PT&I COMPOS.	WITH PT&I COMPOS.
BLOCK LAYER	9.20	1.94	.63	11.77	3.30	.94	10.14	12.71	16.01
CARPENTER	8.78	1.86	.60	11.24	3.15	1.22	10.00	12.46	15.61
CEMENT FINISHER	9.20	1.94	.63	11.77	3.30	.94	10.14	12.71	16.01
COMMON LABORER	6.70	1.44	.47	8.61	2.41	.90	7.60	9.51	11.92
SKILLED LABORER	6.85	1.47	.48	8.80	2.46	.90	7.75	9.70	12.16
ELECTRICIAN	*10.56	2.21	.71	13.48	3.77	1.51	12.07	14.99	18.76
CABLE SPLICER	*10.81	2.26	.73	13.80	3.86	1.51	12.32	15.31	19.17
IRON WORKER	10.28	2.16	.70	13.14	3.68	2.25	12.53	15.39	19.07
MILLWRIGHT	10.82	2.26	.73	13.81	3.87	1.35	12.17	15.16	19.03
PAINTER	8.75	1.85	.60	11.20	3.14	.86	9.61	12.06	15.20
PIPEFITTER	*13.40	2.78	.89	17.07	4.78	1.48	14.88	18.55	23.33
ROOFER	7.90	1.68	.55	10.13	2.84	.60	8.50	10.73	13.57
SHEET METAL	11.29	2.36	.76	14.41	4.03	1.22	12.51	15.63	19.68
CRANE OPERATOR (I)	9.60	2.02	.65	12.27	3.44	.90	10.50	13.17	16.61
BULLDOZER (II)	9.00	1.90	.62	11.52	3.23	.90	9.90	12.42	15.65
PAVING MACHINE (III)	8.50	1.80	.58	10.88	3.05	.90	9.40	11.78	14.83
WELL POINT (IV)	8.10	1.72	.56	10.38	2.91	.90	9.00	11.28	14.19
OIL & PUMP (V)	7.40	1.58	.52	9.50	2.66	.90	8.30	10.40	13.06
DUAL & AXLE (IV)	8.10	1.72	.56	10.38	2.91	.90	9.00	11.28	14.19
TRUCK DRIVER	7.40	1.58	.52	9.50	2.66	.90	8.30	10.40	13.06
OFF HIGHWAY (VI)	5.60	1.22	.40	7.22	2.02	.90	6.50	8.12	10.14

* TRAVEL TIME BEYOND 40 MILES IS INCLUDED IN HOURLY RATE.

LABOR BASE ON DAVIS-BACON RATES, 4 DEC. , 1979.

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PREPARED BY

Carlos A. Cardona
REVIEWED BY

ESTIMATING FOR SUPPORT CONTRACTORS USE:

CONSTRUCTION	IRONWORKER	13.15
	ELECTRICAL	12.95
	MECHANICAL	16.04
	LABORER	8.12
MAINTENANCE		13.00
DESIGN		13.50
ELECTRICAL		16.00

OTHER RATES VARY FROM $10-22

GSE FAB/MFG. RATE $18.00 MANHOUR PLUS G&A PLUS PROFIT

TR-1511

KSC MATERIAL COST INDEX FOR DEC. 1979

SECT	DIV. NAME	MATERIAL	JAN.74 UNIT $	JAN.76 UNIT $	QUANTITY	*SUG MTL UNIT PRICE DEC.79 UNIT $	JOB $
1D	GAN REQ	5/8" PLYWOOD GOS	0.41	0.38	200 SF	0.56	112.00
2P	SITE WORK	ASPH PVG-1-1/2" FINE 20.00 TON	0.80	0.98	30 SY	1.68	50.40
3A	CONCRETE	3000# REDI-MIX	23.25	27.70	5 CY	37.50	187.50
		Rebar	0.18	0.21	500 LB	0.21	105.00
		3/4" PLYFORM	0.47	0.37	250 SF	0.78	195.00
4A	MASONRY	CONC. BLOCK 8x8x16 300 SF	0.30	0.35	339 EA	0.44	149.16
5B	METALS	TOWER STEEL	1.09	1.10	100 LB	1.25	125.00
		Shop Fab Est at	0.86	0.80		0.84	
		Installed Est at	0.23	0.30		0.41	
5J	METALS	WAREHOUSE SHAPES DELIVERED	0.23	0.28	1000 LB	0.27	270.00
6A	CARPENTRY	2" X 4" S4S PINE	0.20	0.21	200 BF	0.27	54.00
7M	MOIST PROT	90# ROLL ROOFING	6.90	8.12	10 SQ	9.87	98.70
7J	MOIST PROT	FIBER. INSUL 3-1/2"	0.09	0.11	1000 SF	**0.14	140.00
8G	DOORS	3' X 7' AL/LOCK & FR	11.43	19.76	10 SQ	25.48	254.80
8J	WINDOWS	3' X 3' AL/FR. SCR & OP	5.71	7.39	4 SF	4.49	17.96
9B	FINISHES	VINYL ASBESTOS TILE 3/32"	0.33	0.38	100 SF	0.47	47.00
9C	FINISHES	1/2" GYPSUM BRD	0.06	0.08	1000 SF	**0.10	100.00
9D	FINISHES	ACOUSTICAL TILE W/SUSP.SYS	0.33	0.50	100 SF	0.66	66.00
10	SPECIALTIES						
11	EQUIPMENT						
12A	FURNISHINGS	VENETIAN BLINDS	1.46	1.21	10.5 SF	3.14	33.00
13A	SPEC CONSTR	ELEVATED FLOOR SYS ALUM.	4.34	7.70	10 SF	7.65	76.50
14H	CONVEY SYS	FAB & ERECT "I" BEAMS	0.37	0.80	100 LB	1.17	117.00
15A	MECHANICAL	CI PIPT 6" ($0.24 LB) CLASS 150 $5.20 CL	3.60	4.52	25 LF	6.10	152.50
16J	ELECTRICAL	1/2" CU TUBING ($3.48LB) BARE CU ($1.08 LB)	0.26	0.26	500 LF	0.69	345.00
17C	WELDING	1" WLD PIPE 304 SS($1.90 LB)	1.85	3.80	50 LF	3.47	173.50
18	HVY CONSTRU	CRANE RENTAL (30 TON) (PER MONTH W/O OPR 9,200.00)	40.00	42.50	4 HR	56.00	224.00
19 5k/15D	SHEET METAL	0.63" ALUM SHEET	0.69	0.99	200 LB	1.57	314.00
							3,408.02

3,408.02 X ADJUSTMENT FACTOR OF .493628 KSC MATERIAL COST INDEX FOR DEC. 1979 IS 1682-68.2% INCREASE OVER JANUARY 1974

* TO BE USED IN DETAILED ESTIMATES. CONFIRMED BY QUOTES WHEN COST EXCEEDS $1000.

** MAY VARY DUE TO AVAILABILTY.

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SECT	DIV. NAME	TYPE	COST	UNIT	COST	UNIT
10B	SPECIALTIES	TOILET PARTITION W/HARDWARE			430.00	EA
10N	TACKBOARD	MAGNETIC WALLBOARD 4'X7'X1/4"	288.00	EA	10.29	SF
12	FURNISHINGS	CARPET, PAD & INSTALLATION	24.08	SY	2.68	SF
13	SPEC. CONSTR.	APU/AMMONIA EXHAUST SYS			452.56	LF
13A	SPEC. CONSTR.	ELEVATED FLOOR SYS ALUM SIMPLE/COMPLEX	13.00	SF	17.57	SF
13F	GASEOUS SYS	VALVE SHUT-OFF SS 2"	3,275	EA	43.09	LB
13F		16 PNEUMATIC PANELS, PACKAGE 8 HIGH-LOW	161,000	EA	5,200	EA
13F		PANEL ASSY GHE CHARGING/REGULATION ASSY				
		HMF 3'X3' 5000 PSI	13,812	EA	1,535	SF
		GO2 ECLSS TRAILER 3'X3' 6000 PSI	9,240	EA	1,027	SF
13R		SEAL SYSTEM ORBITER RSS 9" RUBBER, 200LF	7,268	EA	807.56	SF
		BID ITEM TASK 5 LC-39B-RSS	346,200	SYS	1,731	LF
13T	METALS	PREFAB STEEL BLDG (10,000 SF)	34.40	SF	19.30	AS/SF
		MECH. PLUMBING SPRINKLER S&S & AC (ELECT)	11.73	SF	3.63	SF
14J	CONVEY SYS					
14J		OPF BRIDGE CRANE 30T, 141' SPAN OPF HB 1&2	546,935	EA	18,231	TON
14J		2-125 TON BRIDGE CRANE 76' SP, 75' LIFT VAB/SRB	234,200	EA	1,874	TON
14J		HOIST 50 TON, 90' LIFT, EXPLOSION PROOF MDD	85,008	EA	1,700	TON
14J		HOIST 20 TON OPF PLATFORM	1,239	TON	.85	*PSF
14J		DRIVE TRUCKS OPF PLATFORM	101,140	EA	7.09	*PSF
14J		MOVEABLE OPF PLATFORM HB-1	10,579	EA	.74	*PSF
14J		HB-2 OPF PLAT. & CABLE-PIPING	3,079,200	EA		
14N		TRUCK ASSY "PCR" PAD A 246 SF	370,371	EA	1,506	SF
15	MECHANICAL	HINGE COLUMN BEARINGS & HOUSINGS LC-39B RSS/	1,547,100	EA	10.97	LB
15		HINGE COLUMN BEARING ASSY. PCR LC-39A	1,238,989	EA		
15A		WATER CLOSET FIXTURE & ROUGH-IN	942.00	EA		
		ROUGH-IN	591.00	EA		
		WATER CLOSET AND FITTINGS	350.00	EA		
15A		PLUMBING SUMMARY-PSCL (4100 SF)			7.04	SF
15C	AIR CONDITION	COOLING ONLY 20T-PSCL	2,469	TON	12.03	SF
15C	AIR CONDITION	GALV. DUCT WORK & SUPPORT	7.27	SF	3.41	LF
15C	AIR CONDITION	DUCT WORK INSULATION-PSCL			7.62	SF
15C&U	A/C HEATING	A/C & HEATING W/OUT CHILLERS OPF II	1,493	TON	23.68	BSF
15C&U		A/C & HEATING-PSCL	2,318	TON	13.75	SF
15D		TANK SS 5,000 GAL	16,774	EA	4.41	LB
15G	SEWER	SEWER LINE VITRIFIED CLAY 6"-8"	21.91	LF	23.70	LF
15H	ELEC. HEATING	4 INFRARED RADIANT HEATERS 526 LF CONDUIT	6.18	LF	813.00	EA
15P	FIRE PROTECT	1/2" PENDANT SPRINKLERS 32 483 LF PIPE	15.90	LF	240.00	EA
15P		SPRINKLERS TO 5' LINE OPF II 4.41 BSF	280.00	EA	2.80	SF
15P		SPRINKLER LC 17 OPERATION 3,638 SF 38 HEADS	7.32	SF	701.00	HD
15P		HEAT DETECTOR	297.00	EA	2.97	SF
15P		HALON FIRE PROT. SYS. S-BAND BOTTLE 3476 EA	34.98	LF	15.52	SF
15P	(MECH.ONLY)	HALON FIRE PROT. SMALL SYS FTC BOTTLE 5041 EA	54.32	LB	10.31	SF
15R	VENTILATION	VENTILATION PSCL	.96	SF		
15U	HEATING SYS	HEATING 164,000 BTU SYSTEM-PSCL	48.20	MBTU	1.93	SF
15Y	WATER LINE	CAST IRON PIPE C.L. LAID IN TRENCH 6"-8"	28.47	LF	24.39	LF
15Y		GALV. PIPE LAID IN TRENCH 2"-4"	20.15	LF	27.75	LF
15Y		PIPE 72" O.D.X.375" WALL ASTM-A36			228.83	LF
15Z	PIPE SS	304 XXS W/SUPPORTS & CLEANING 2"-100' LF	9,376	EA	93.76	LF
		2" XXS 304 SS PIPE 100'	4,291	EA	42.91	LF
		FITTINGS FOR 2" PIPE (100')	1,967	EA	19.67	LF
		CONCRETE FOR PIPE SUPPORTS (10 EA)	208.50	EA	20.85	LF
		CLEANING 2" PIPE 100'	1,031	EA	10.31	LF

* PLATFORM SQUARE FT.

KSC MONTHLY FACILITY CONSTRUCTION COST INDEX BASED ON BIDS & GOV. ESTIMATE

LAUNCH FACILITY CONSTRUCTION COSTS

LC 39 PAD B ROTARY SERVICE STRUCTURE (RSS), PAY LOAD CHANGE OUT ROOM (PCR) 29,944 PSF BID 6/6/79

ARCH/STR. EXCEPT AS LISTED	$255.48 PSF	$7,650,101
HINGE COLUMN BEARING	51.67 PSF	1,547,100
RSS DRIVE TRUCK	71.23 PSF	2,133,000
INTERIOR PLATFORM	41.53 PSF	1,243,500
MAIN DOOR	29.06 PSF	870,200
ORBITER SEAL SYSTEM	15.13 PSF	453,000
MECHANICAL-PIPING & MISC.(except as listed)	47.15 PSF	1,411,853
PAY LOAD A/C	14.60 PSF	437,300
RSS ELEVATOR	10.74 PSF	321,500
CENTRAL VACUUM SYS.	1.78 PSF	53,200
ECS DUCT MAL & PAYLOAD HVAC	5.34 PSF	160,000
HOISTING SYSTEM	4.29 PSF	128,600
ELECTRICAL	64.49 PSF	1,931,164
	$612.49 PSF	$17,690,000

ORBITER PROCESSING FACILITY PHASE I BID 5/14/75 52,800 SF

ARCH/STR.	$ 61.47 BSF	$3,245,805
MECH.	26.34 BSF	1,390,636
ELECT.	11.59 BSF	612,062
FIRE PROTECT.	2.84 BSF	150,489
	$102.24 BSF	$5,398,962

FIRE PUMP HOUSE 3,400 SF	$ 23.08 BSF	$ 78,471
ARCH/STR.	42.91 BSF	145,913
MECH & FIRE PROTECT.	11.59 BSF	39,406
ELECT.	$ 77.58 BSF	$ 253,790

ORBITER PROCESSING FACILITY PHASE II BID 5/14/76 29,200 SF

ARCH/STR	$ 91.78 BSF	$2,680,103
INTERIOR MECH.	29.93 BSF	874,100
INTERIOR ELECT.	12.96 BSF	378,477
	$134.68 BSF	$3,932,680

ORBITER PROCESSING FACILITY II ACCESS PLATFORMS BID 2/2/77 - PLATFORM S.F. 14,262

ARCH/STR	$ 88.30 PSF	$1,259,384
MECH.	72.99 PSF	1,041,049
ELECT.	54.60 PSF	778,767
TOTAL	$215.89 PSF	$3,079,200

SAMPLE FROM TR 1508

SYSTEM SUMMARY OF GOVERNMENT ESTIMATE FOR SYSTEMS

SHEET 3 OF

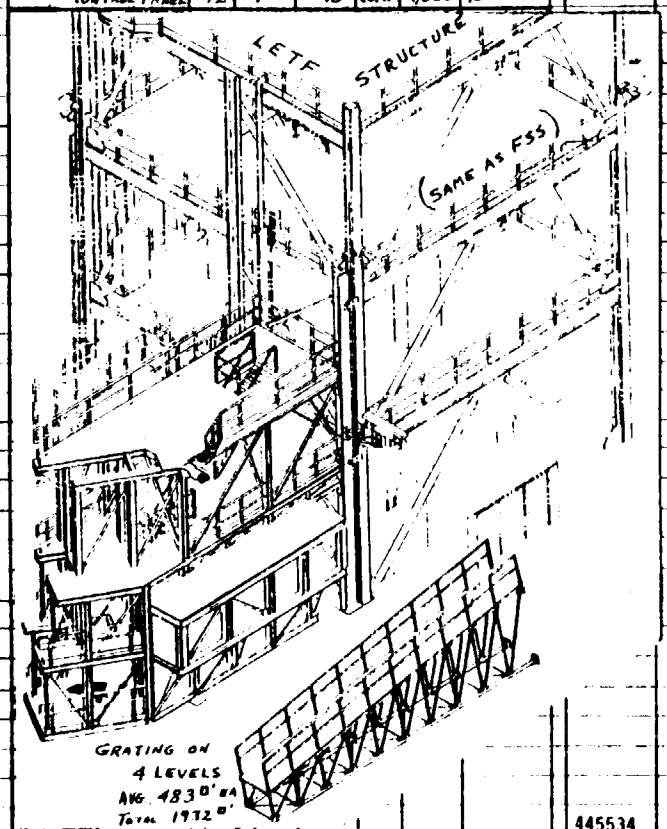
DRAWING NO	SHEETS	PCN	LOCATION	PROJECT
79K05857	156	76535	KSC LETF	ET H2 VENT UMBILICAL & INTERTANK ACCESS ARM

WORK ORDER/CONTRACT	ARCHITECT/ENGINEER	ESTIMATOR	CHECKER	CODE / SUBMITTED
2766 10-0054-9	J. PERRY PRC 1261	G. THOMASON, PRC-1391	C. PIERCE PRC-1391	C-100 / 8/20/79 REV. 9/14/79

CONSTRUCTION COSTS

A/S TRADES DIV. TITLE	QTY	UNIT	COSTS $/UNIT	$/LF	TOTAL	DIV. TOTAL	SYS. INVOLVED MECH	ELEC
1. GNL. COND.				*				
(15%)	420	BSF	136.56	50.94	57,357		X	
2. SITE								
CLR/GRUB								
DEMOLITION								
ERTHWK/FILL								
PILING								
PAVING								
UTILITIES								
OTHER								
3. CONCRETE								
FMWK								
REBAR								
CONCRETE								
4. MASONRY								
5. METALS	81	TON	5500	396.		445534		
STRUCT STL	61.6	TON	5999	328.	369540			
PLTFM ACCESS ARM	3.7	TON	6929	22.77	25636			
MISC 1-1/4X1/4 grating	12	TON	3355	35.75	40255			
ALUM 554 LF GALV. RAILING	3.7	TON	2731	8.97	10103			
6. WOOD/PLASTICS								
7. MOISTURE PROTECT								
8. DOORS & GLASS								
9. FINISHES								
PAINTING								
OTHER								
10. SPECIALTIES								
11. EQUIPMENT								
12. FURNISHINGS								
13. SPECIAL CONSTR.								
14. CONVEYING SYS.								
HOISTS								
CRANES								
OTHER								
TOTAL A/S						445534		

SYSTEMS TRADES DIV. TITLE	PIPING/DUCTING CABLING/CONDUIT SIZES	MATL	QTY	UNIT	COSTS $/UNIT	TOTAL	OTHER $	$/LF	TOTAL	DIV. TOTAL
15. MECHANICAL	1/4" & 6"	S/S & GALV.	1126	LF	44.25	49829				49829
A. LH2 VENT	4" & 10"	S/S	35	LF	36.23	1268				
B. PNEUMATICS	1/4" & 1/2"	S/S	490	LF	19.30	9456				
C. FIRE PROTECT	1" & 6"	GALV.	161	LF	99.36	15997				
D. HYDRAULICS	1/4" & 3/4"	S/S	440	LF	11.59	5098				
E. CONTROL PANEL	1/4" & 1/2"	S/S	18	COMP	1,001	18 010				
TOTAL SYSTEMS						49829	445534		445534	495363



DESCRIPTION

SCOPE (circle one)	BASIC PLAN (circle one)	COMMENTS
1 FAIR	A SQUARE	SPECIAL CONDITIONS NOT NEEDED.
2 AVERAGE	B RECTANGULAR	
3 GOOD	C IRREGULAR	
(4) COMPLEX	(D) VRY IRREG	
5 SOPHIST.	E	

DESIGN DATA

TYPE FAC OPEN STEEL STR. SF AREA 420
CAPACITY
HEIGHT STORIES 42.5 FT
STRUCT FRAME STEEL
VOLUME CF

SPECIAL FEATURES

INTERTANK ACCESS ARM 4'X11'X40.5' LONG
WEIGHT 3.7 TONS EST. COST $25,636
HYDRAULIC CONTROL PANEL 18 COMPONENTS
EST. COST $18,945 FGE MTL. $735
GFE STR. STL. (IN PLACE) 4.1 TONS
$15343 GRATING 1932 SF 40255 or 20.84/S
TOTAL SF COST 525084/1932=$271.78

CONSTRUCTION BID DATA (IFB 10-0054-9)

MECH LF	1126	$ 44.25	/LF	49829
ELEC LF		$	/LF	-0-
SUBTOT LF		$	/LF	
OTHER STRUCTURAL		395.68	LF	445534
SUBTOTAL	$1179.44	BSF $139.93	LF	495363

SPECIAL COST FEATURES

HAZARDS		$	/LF	
FAB/TEST CLM/CERT		$	/LF	
GFE		$	/LF	
OTHER 6PL. COND.		$ 26.40	/LF	29721
SUBTOTAL		$	/LF	
TTL PROJ	$1250.20	BSF $466.33	/LF	525084

BID DATE 8/31/79
AWARDED TO INDUSTRIAL STEEL $461635
CONSTRUCT TIME SPAN CAL DAYS 300
NO OF BIDS 5 GOVT EST POS 4
PCT DIF, AWARDED BID & GOVT EST -12.0

BIDDERS:

	(L)	(H)
INDUSTRIAL STEEL	$ 461,635	
NEW WORLD CONSTR.	$ 473,500	
BELKO STEEL INC.	$ 474,410	
GOV. ESTIMATE	$ 525,084	
IVEY STEEL ERECT.	$ 617,281	

* LF COSTS BASED ON 1126 LF (MECH)

FORM 1

DATA REQUIRED FOR TECHNICAL PROGRAM BROCHURE

1. Title (All Caps) CONCEPTUAL COST ESTIMATING USING KSC COST INDEX FOR CONSTRUCTION MANAGEMENT

2. Author(s) (All Caps) JOSEPH A. BROWN, CCE

3. Position KSC LEAD COST ENGINEER

4. Company NASA-KENNEDY SPACE CENTER, FACILITIES ENGINEERING DIVISION (DD-FED)
KSC HEADQUARTERS BLDG, ROOM 3433A, KENNEDY SPACE CENTER, FL 32899

5. Supervisor's Mane L. S. HARRIS, CHIEF, FACILITIES ENGINEERING DIVISION

6. Member Grade (as applicable) Full Member since 1967

7. Abstract
(150 words max.)
Use 2nd sheet as required.

The development of the Kennedy Space Center Cost Index from January 1974 to the present will be discussed. One part of the cost index includes a graphic chart of the KSC labor and material indices which is used as an aid to evaluate past and present costs and for predicting the cost escalation on facility design and construction.

This index incorporates price adjustments related to the KSC location and specialized construction requirements. It provides management, design engineers, and estimators an up-to-date reference for local labor and materials prices.

As part of the index, over 230 rule-of-thumb unit costs have been developed that aid in the conceptual formulation of budget cost for new and modified facilities.

This index is one of the many tools used by KSC Design Engineering to evaluate cost trade-off studies that resulted in design and construction of cost effective design and construction of KSC Space Shuttle facilities. These facilities will be used to launch and recover elements of the Space Transportation System which will assure the United States continued pre-eminence in space exploration and development.

8. Include Photo (head & shoulders glossy, black & white)

9. Abbreviated title (6 words max.) for program schedule:

Conceptual	Estimating	with	KSC	Cost	Index
1	2	3	4	5	6

FORM 3.

AMERICAN ASSOCIATION OF COST ENGINEERS

BIOGRAPHICAL SKETCH

Speakers Name: Joseph Andrew Brown, CCE

Position: Lead Cost Engineer

Company: NASA-Kennedy Space Center

Address: Facilities Engineering Division (DD-FED)
KSC Headquarters Building Room 3433A
Kennedy Space Center, Florida 32899

Title of Paper: Conceptual Cost Estimating Using KSC Cost Index for Construction Management

Professional Experience:
$2.4 billion of cost estimates prepared and/or reviewed with NASA, Corps of Engineers, general and subcontractors, private consultations, teaching seminars, State and County License July 1968, Construction Cost Engineer

Education: University of Florida 1959
Bachelor of Building Construction "BBC"

Technical and Professional Society Affiliations:

AACE Member
ASSE Member
SAME Member

Publications, Papers and Patents: Published nine technical papers, estimating, bidding, escalation and labor productivity, construction management cost index, cost control, Apollo, Space Shuttle; Published estimating work book "How to Sharpen your Bidding." Writing "Estimation of Construction Costs" for Marcel Dekker.

Other Accomplishments and Honors Received:
AACE 1969 Member of the Moment
SAME Canaveral Post "Engineer of the Year."
NASA-KSC "Federal Employee of the Year."
First Certified Cost Engineer in Florida, September 14, 1976
General Arrangements Chairman, 1975 AACE Annual Meeting in Orlando, FL., June 29-July.

(Attach additional sheets if necessary)